
Using architecture to reconnect cities with nature

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USING ARCHITECTURE TO RECONNECT CITIES WITH NATURE

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"Cloud garden" on the top of Tour D2
©Bechu & Associés

Working with his partners and his daughters Clémence and Aliénor¹, Anthony Bechu runs Bechu & Associés, an architectural firm that delivers projects in France and internationally, including in Russia, China, Morocco and Iraq. Its multi-disciplinary approach draws on the work of engineers, scientists, sociologists, urban planners, landscape and graphic designers as well as interior decorators, in order to create projects in the fields of urbanism, architecture and heritage conservation.

Along with her sister, Clémence Bechu is the fourth generation of the family to continue the story of the firm, which was founded in 1920. As head of Development, her work focuses extensively on innovative approaches and strategic partnerships for research and development and sustainability.

The combination of climate change and massive urbanization makes city ecosystems vulnerable. Faced with this reality, bioclimatic architecture and regenerative planning provide a wealth of tools that include urban agriculture, which is increasingly widespread in the context of growing green value in the real estate sector. Bechu & Associés is an architectural practice that embraces this movement, working with its partners to design parametric modeling tools to improve the sustainability of architectural and urban planning projects. In this process, bio-inspiration plays a key role, by leveraging nature's solutions to design places where climate and culture combine, and where nature repairs the ties that bind cities to the countryside.

¹ Aliénor Bechu is an interior architect and designer. She runs Volume ABC, the firm's interior design branch.



Research center project for Climate City - ©Bechu & Associés

Bechu & Associés is passionate about integrating the living world into architecture to repair broken ties between cities and the countryside, particularly through regenerative planning. How does this feed into your architectural practice, and what role does urban farming have as part of this approach?

Anthony Bechu: It is now a commonplace that nature creates value in real estate, as evidenced by the plethora of labels such as BREEAM, LEED and WELL. The new awareness of the green value² of real estate assets is a very welcome sign. In March 2018 at MIPIM, the international real estate congress held in Cannes, our firm and 50 or so other professionals signed up to the BiodiverCity charter, created by the International Biodiversity & Property Council (IBPC), signifying our commitment to incorporating living systems into every architectural project. Biodiversity can be introduced into the city in *ad hoc* ways that inspire contemplation, such as open spaces, vacant plots and gardens, but also in a more productive form, such as rooftop greenhouses and collective vegetable gardens. Urban agriculture is a wonderful tool for boosting cities' resilience and sustainability. I'm thinking of things like Parisculteurs, GreenSky or the Fermes de Gally outside Paris, which offer a model for a specialized peri-urban farm able to supply city dwellers with locally grown fruits, vegetables and flowers. Our project portfolio includes the restoration of a former Banville garage, a building we designed 30 years ago. This will include planted roofs and a greenhouse on the top-floor terrace that will be open to the public and will grow supplies for the ground-floor restaurant.

Clémence Bechu: The engagements our firm has made are indicative of the growing awareness, made all the more acute by the climate emergency, that restoring ties between people and natural ecosystems is a real opportunity to innovate and build new models for urban development.

Cities are responsible for 60% of climate change and they are currently suffering its effects as well as the financial, social and health implications. To help cities deal with these issues, Yves Tourre, a climatology researcher at Columbia University,



Tour D2 at La Défense, Paris, 2014 - ©Bechu & Associés

² "Green value" is the additional value created by a building that delivers better energy and environmental performance than another similar building.



"Cloud garden" on the top of Tour D2 - ©Bechu & Associés

and Laurent Husson, an aerospace specialist, have launched a project called Climate City that we are proud to partner with. The first specialist operator in urban climates, it proposes using drones and climate modeling tools to look at the climate between 150 and 1,500 meters above cities. This approach fills a gap in current climate analysis – the conventional approach for cities is generally meteorological only, and global analyses by expert groups such as the IPCC do not provide any tools to help city policymakers. Data collected by Climate City will make it possible to pinpoint heat islands in a city as well as anticipate pockets of air pollution or flooding, helping to decide the best locations for green spaces as part of cities' climate plans. We have worked on the design of a research center that will be the headquarters for this initiative, and in a more general sense we work for the emergence of climate-aware urban planning.

Our regenerative planning approach involves not only reintegrating nature into the city, but also reintegrating the city into nature's core cycles. In common with many other industries, planners and architects can seek inspiration from nature's circular way of organizing things. Nature works in loops, quite unlike the linear ways humanity has favored, and this applies as much to procurement as to

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waste management, energy and water cycle. A bottomless wealth of positive interactions makes nature a formidable engineer, so why not copy it!

Your approach consists in seeking inspiration in natural morphologies and processes. Can you give a few examples of this bio-inspiration as expressed in architectural projects?

C.B.: Bio-inspiration takes the living world as a model, seeking to use architecture to recreate a relationship with nature. There are two forms of bio-inspiration: biophilia and biomimicry.

Biophilia involves directly or indirectly integrating nature into human installations to create wellbeing. This is the approach we used in 2015 for the project to renovate the Miramar hotel and thalassotherapy center in Arzon, Brittany. We took inspiration from marine ecosystems when structuring the space and creating the interior design. Biophilia can be applied to design using organic forms, and natural materials and colors whose impacts on the quality of life are scientifically proven.



Accommodation district for the Skolkovo Innovation Center, Russia, 2017 -
©Bechu & Associés

Biomimicry, as theorized by the American biologist and author Janine Benyus, is a resolutely scientific approach. Biomimicry involves following the example of organisms and living systems, based on observing their morphology and processes, to develop innovations able to provide answers to contemporary ecological challenges.

A.B.: For Tour D2 (2014), we took an approach halfway between biophilia and biomimicry as part of the renewal plan for the La Défense business district of Paris. The honeycomb exostructure wrapping the tower was based on the organic model of the periosteum membrane that covers bones. This allowed us to use 30% less material with a consequently lower carbon footprint. At the top of the 171-meter tower the “cloud garden” transforms the tower into an allegory for a tree with an island of urban biodiversity where birds have established their nests.

Besides, biomimicry has enabled us to construct buildings with outstanding energy performance in parts of the world with severe climate constraints.

For the Skolkovo Innovation Center in Russia (2017), we drew on the social organization of penguins when

setting out the ground plan for the district that houses researchers’ families. Working with biologists and using fractals³ found in nature, we were able to gain 5°C above the outdoor temperature in midwinter at each of the 10 circular plots.

For the Mohamed VI Polytechnic University project currently underway in Laayoune, in Western Sahara, careful study of desert lines and analysis of climate data led us to design a building that is 80% energy passive and whose indoor temperatures will never exceed 26°C in high summer without using air conditioning (apart from inside the main lecture theater). We also developed a wastewater recovery system for spray-cooling the space, in applying principles from the circular economy.

C.B.: These projects demonstrate the relevance of biomimicry. They are first made possible by convictions shared with the developers who are financing the project, and above all, because they are multi-disciplinary collaborations. These are collective creations, made possible thanks to the work of

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³ A fractal is a mathematical object, such as a curve or surface, whose structure does not vary with changes in scale. Fractals are commonly observed in nature.



Indoor water spraying for the Mohamed VI Polytechnic University project, Laâyoune, Western Sahara - ©Bechu & Associés

scientists, engineers and consultancies specializing in the environment, parametric modeling and structure. For each project, we set up a team with the range of complementary expertise needed for us to jointly define the structural objectives, obtain the relevant data and generate the algorithms that help us to create our plans. Other actors are also helping to spread the word about this approach among the general public and fellow professionals. One such is Alain Renaudin, founder of Biomim'expo,⁴ an annual event that we partner with, which showcases pilot bioclimatic initiatives to private and trade visitors alike.

Some territories use biomimicry in planning for their future growth. One such is France's Nouvelle-Aquitaine region, whose proximity to the ocean means it is particularly engaged in climate issues. In Biarritz, the Technocité innovation cluster will be home to a marine center of excellence in biomimicry for researchers from IPREM (the Institute of Analytical and Physicochemical Sciences for Materials and the Environment), a CEEBIOS branch (Senlis European Center for Excellence in Biomimicry)

Facilitating the return of rurality to city centers is our way of making sure that there is a place for everybody at the center of the "village," bridging the gap between history and modernity

and a business incubator. The project is the subject of an architectural competition and our proposal is one of those selected. We adopted an ecosystemic approach inspired by the relationship between ocean and climate. With expert input from climatologist Yves Tourre and Françoise Gaill, who specializes in the biology of abysses, we designed a regenerative building that should qualify for Living Building Challenge certification. This certification, which would be path-breaking in France, imposes among other things 105% energy self-sufficiency (net positive) and full autonomy in terms of water. Just as ascidians filter seawater, our project, which we call *Estran*, filters water from the land. It has a roof that is both active and liquid, a biomimetic ecosystem in its own right that fits into the land and sea systems of its environment. It filters and removes pollution from the water in its environs (from roadways, rainwater and wastewater) for use in the building and it returns to nature the purified water it has no need for. The project also includes an educational pathway and a wetland zone to encourage the site's biodiversity to the fullest. Just as in nature, this project is above all a system that provides services to its neighbors, and vice versa.

⁴ The 3rd consecutive Biomim'expo will take place on September 11 and October 22, 2019 at the Hotel de Ville and Cité des Sciences et de l'Industrie in Paris.

N.B.: The competition was still under way at the time of writing. The winner will be announced during the August 24-26 meeting of the G7 in Biarritz.

What role do you think rurality and farming can play to reestablish connections between city and nature?

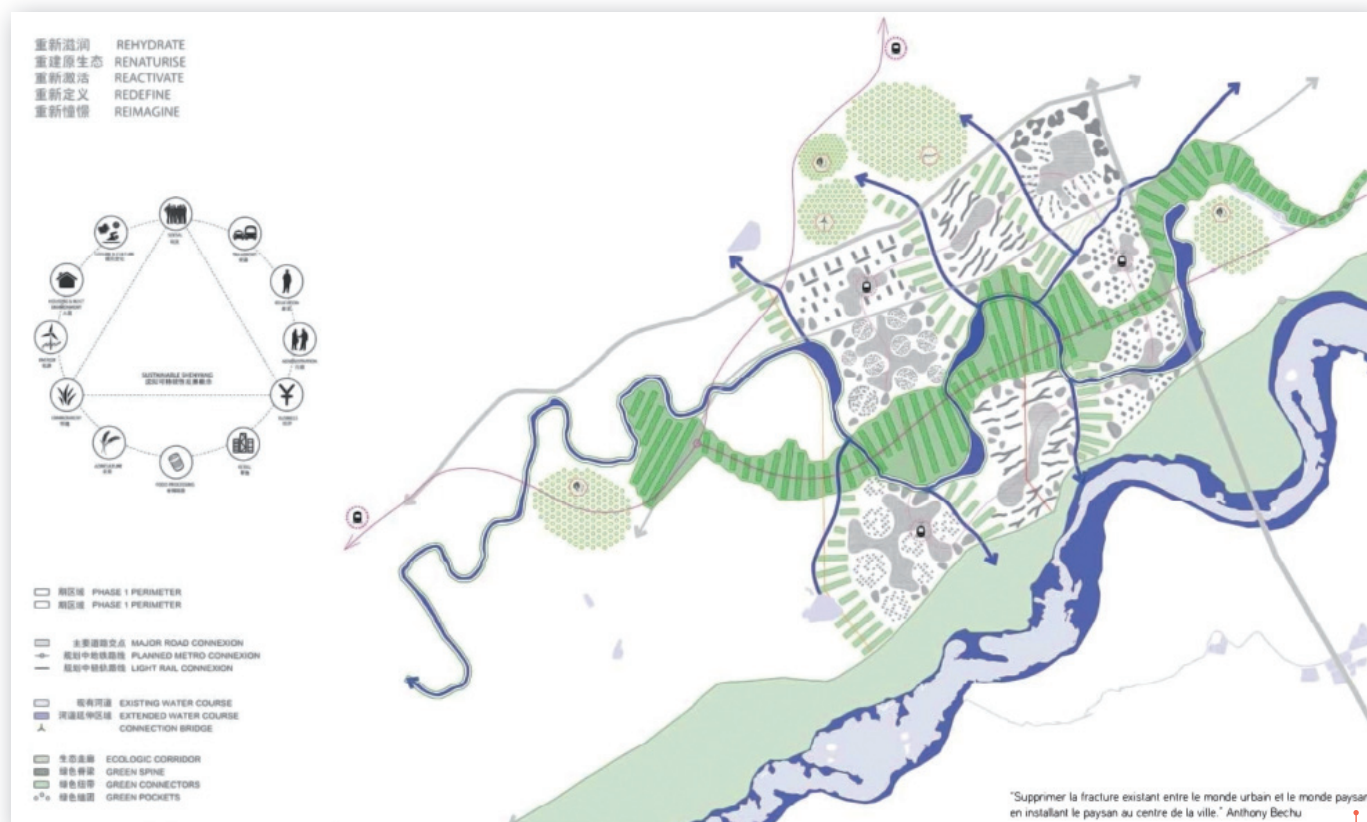
A.B.: Reconciling city with nature requires more than just a scientific approach. We are also striving to heal divisions between the urban and rural worlds, which is an element of the current societal crisis in Europe. In emerging economies, massive urbanization is uprooting people from the ways their lives were previously structured. They have to renounce their long-established practices to live in spaces often designed on the American planning model. This applies particularly in Africa, where megacity planners often overlook all reference to the founding social and cultural models of the African village.

These are issues we are working on in China. In satellite cities⁵, we are looking into ways to bring the rural world back into the heart of the city, recreating ties between country- and city-dwellers through landscaping and shared spaces. In Shenyang, capital of Liaoning province and the economic and cultural hub of northern China, we worked with local policymakers on the

design of a master plan for an eco-city on a 10-square-kilometer site. For the purposes of this major China-France cooperation project, we highlighted the importance of a regenerative planning approach to remove pollution from sites and create an urban district truly integrated into the rural landscape. We used the Biogée city model we have developed along four guiding principles: hyperconnectivity, mixed-use, energy management, and balanced space management. This is the ideal of a city where farming world and aquatic systems occupy a central place. Moreover, to be sustainable, the city of the future cannot turn its back on its past nor its culture, including its rural past. It must also reflect its history and geography. This is the thrust of the projects in our portfolio in the medieval cities of Pingyao (2008) and Putian (in progress). Located 800 km southwest of Beijing in the province of Shanxi, Pingyao is a UNESCO world heritage site where we have created public spaces that pick up on the idea of the gallery, a traditional Chinese space for socializing and learning. Inspired by feng shui, we have also set out a park crisscrossed by canals in the area around the ancient ramparts that were formerly hidden by industrial clutter. In Putian, a city that has preserved a balance between rural and urban, we are currently working on ways to make best use of the city's fish-farming basins.

Facilitating the return of rurality to city centers is our way of making sure that there is a place for everybody at the center of the "village," bridging the gap between history and modernity. Urban agriculture, by integrating both productive and contemplative green spaces in a city, is part of this process.

⁵ Satellite cities are smaller cities located near to larger ones.



Master plan for the eco-city of Shenyang, China